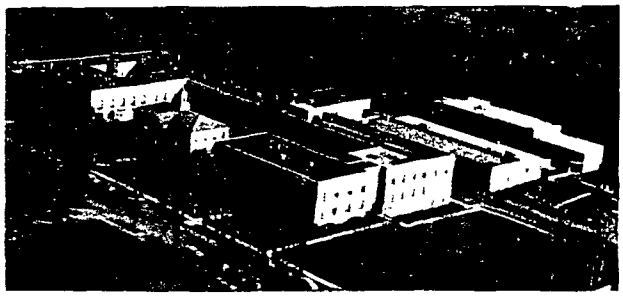

THE INSTITUTE OF PAPER CHEMISTRY, APPLETON, WISCONSIN

REPORT TWO

Monthly Progress Report

to

U. S. ARMY CHEMICAL CENTER PROCUREMENT AGENCY

Project 2256

December 27, 1960

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THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL

INTRODUCTION

Report One on this project described the general background, proposal and authorization for this program. During the period ending November 28 the principal activities included a visit to the Army Chemical Center, review of reports of previous work on this program, assembly of equipment, procurement of materials, and several other preliminary contacts.

VISIT TO ARMY CHEMICAL CENTER AND REVIEW OF REPORTS

On November 1, 1960, Messrs. Jones and Howells of The Institute of Paper Chemistry visited the Army Chemical Center for a discussion of the general background and other details on this program. Discussions with Messrs. Condon and Ort during this visit and a review of the reports made available subsequently, led to a summary of the requirements for the improved diffusion board as one retaining the protective properties of the presently available board with as much improvement in physical properties and permanence as possible.

Protective properties may be defined as: 1. adequate diffusion characteristics (measured as carbon dioxide diffusion and being as high as possible but not less than 0.02 centimeters^2 per second), 2. resistance to aerosol penetration (measured by the DOP test with a specification of not over 0.015% penetration under the test conditions described), and 3. a minimum gas life of 20 minutes under the test conditions described in the

contract. Previous work had indicated that quarter-inch board at a density of 21 pounds per cubic foot and a charcoal content of 5.0 g. per 100 sq. cm. gave good results.

The physical properties of interest include tensile strength, both dry and after water exposure, and water repellency. Various test methods were discussed but it was agreed that the Institute would choose methods pertinent to the needs as understood but also familiar to the insulation board industry.

One factor in permanence is resistance to mold growth in order to avoid detrimental effects on diffusion and other board properties. Preliminary screening may be done in the Institute laboratories using organisms such as Aspergillus niger, and Chaetomium globosum. Any promising materials could be subjected to a more extensive testing by the Army Chemical Center and would involve soil burial, exposure to various organisms and exposure in various standard conditions. Another aspect of permanence will be the retention of gas life under various conditions of exposure, but this also will be evaluated by the Army Chemical Center.

Other discussions involved the susceptibility of ASC charcoal to leaching, poisoning by reducing sugars or other soluble materials, deterioration by exposure to high temperatures, and the effect of these changes on the gas life of the board.

ASSEMBLY OF EQUIPMENT

BOARD-FORMING APPARATUS

A sheet mold suitable for forming of board was already available for use on this project. A special stand was built for this mold, and it was connected to a water supply, to a drain with a short water leg, and through a sixty-gallon vacuum separator to an existing vacuum source. Sixteen-mesh wire screen was obtained for use as forming wire and plates for pressing were also obtained. A suitable hydraulic press and a circulating air oven were already available.

DIOCTYL PHTHALATE SMOKE PENETRATION TESTER

During the week of November 14, the component parts for a smoke penetration test device were brought to the Institute by the project officer, assembled and calibrated, and instruction given for operation of this equipment by the Institute personnel.

CARBON DIOXIDE DIFFUSION APPARATUS

A piece of equipment for testing diffusion of carbon dioxide was designed with dimensions similar to the one used at the Army Chemical Center. However, an all metal construction to minimize leakage and a clamping device to simplify operation were included in the design. Estimate for cost of construction was obtained from a local sheet metal works.

MATERIALS

PULP

By coincidence, representatives of Minnesota and Ontario Paper Company visited The Institute of Paper Chemistry during this period. This occasion was used to discuss briefly with them their experience with the diffusion board production and any suggestions for the present program (see below). One possibility considered for procurement of suitable pulp for laboratory examination of additives had been the purchase and repulping of commercial insulating board. The Minnesota and Ontario representatives indicated that this is not normally satisfactory and they offered to furnish us a quantity of white board wet lap from their commercial insulating board operation. The only practical way to furnish any appreciable quantity is to take the wet-formed board from their commercial machine before entering the drier; this contains a small quantity of wax-rosin size. A quantity of this wet lap is being shipped to Appleton.

In order to compare the possible effect of the wax-rosin size on gas life or on other additives, a small quantity of similar stock without this material was dewatered by hand and also shipped to Appleton. In order to obtain some comparison of forming and pressing conditions in the laboratory with those that might be feasible commercially, a sample of the finished board made from this stock was also requested.

CHARCOAL

On October 14, a request was submitted to the Army Chemical Center for a small quantity of the appropriate charcoal for incorporation in the laboratory boards. We were informed that the minimum practical

container (approximately 250 pounds) was being shipped to us, but this had not arrived at the end of this reporting period.

OTHER CONTACTS

BAUER BROTHERS COMPANY

The possibility of scheduling pilot plant runs on equipment at the Bauer Brothers Laboratories in Springfield, Ohio was discussed in the course of contract negotiations. Subsequently, we notified Bauer Brothers of the initiation of the contract and of our future interest in scheduling pilot runs at their facilities as soon as our laboratory work justifies this. They indicated their willingness to co-operate and suggested that we give them advance notice of five months if possible.

MINNESOTA AND ONTARIO PAPER COMPANY

As mentioned above, there was an opportunity to discuss this program briefly with representatives of Minnesota and Ontario Paper Company. They confirmed that they had made a run of diffusion board, but were not able to discuss any details without an opportunity to refer to their records. Apparently, there had been no difficulty in making this run except that of handling the carbon before it was introduced into the stock. For this run, size had been omitted and some paper mill groundwood added to the regular board furnish. Apparently, hot washing of the stock had been requested but this had not been possible. Assuming that mill schedules and other details are suitable at the time, they will be willing to consider the possibility of co-operating in a future production run.

BOWATERS ENGINEERING AND DEVELOPMENT INCORPORATED

Dry forming of a diffusion board might have some advantages over wet forming. Commercial dry forming of hardboard has enjoyed considerable

expansion in the past few years, one of the most modern plants being that of the Bowaters organization. Process developments have led to improvements in uniformity and strength and to a reduction in the amount of resin required.

In general, this process has been used on boards of comparatively high density where a small quantity of resin is adequate as a binder. An inquiry was addressed to Bowaters Engineering and Development Incorporated with respect to the possible feasibility of preparing by a dry forming process a board 1/4-inch thick at a density of approximately 20 pounds per cubic foot, without involving an excessive quantity of resin binder. In reply, Mr. Meiler of that organization stated that they have been making boards in this density range, utilizing the same fiber as used for their higher density board (including 2% resin) and accomplishing bonding by raising the moisture content to 20 to 30 pounds of water per 100 pounds of dry fiber and then drying the boards in the press.

Mr. Meiler is quite sure that it would be very easy to make boards in the desired density range with 5% resin content and possibly less. He indicated that their program is progressing in such a way that they should know a great deal more about the possible manufacture of boards in this density range in the next two to three months. In turn, we informed him that we were not yet well acquainted with the requirements of the program or the limitations of the conventional wet-forming process, but that we might like to consider the dry

forming approach at a later date. He indicated that his organization would be happy to co-operate with us in any way possible.

THE INSTITUTE OF PAPER CHEMISTRY

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